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GROUND SURFACE ARACHNIDS IN SANDHILL COMMUNITIES OF FLORIDA

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ABSTRACT

Ground surface populations of scorpions, uropygids, pseudoscorpions, solifugids, opilionids, mites, and ticks were studied for two years using pitfall traps and herp arrays set in twelve sandhill communities throughout Florida. Three species of pseudoscorpions, 1 species each of uropygids, solifugids, and scorpions, 5 species of opilionids, and 2 species of ticks were collected. A total of 474 mites were collected. Abundance of pseudoscorpions, uropygids, and acari were significantly correlated with the total mass of plant litter.

INTRODUCTION

Arachnids associated with the different plant communities of Florida are poorly known. Recently Corey and Taylor (1987, 1988, 1989) described the scorpion, pseudoscorpion, opilionid, and spider faunas in pond pine, sand pine scrub, and flatwoods communities. Pseudoscorpion and spider faunas from a northwest Florida salt marsh were described by Rey and McCoy (1983).

This paper describes and compares the scorpion, pseudoscorpion, uropygid, solpugid, opilionid, mite, and tick faunas in twelve sandhill communities throughout Florida (Laessle 1958; Myers 1985).

STUDY SITES

Twelve sandhill communities were investigated from November 1986 through December 1988. Each study site was sampled for four days during each season of the year. Seasons were as follows: winter (December, January, February), spring (March, April, May), summer (June, July, August), and fall (September, October, November). Study sites were located throughout Florida (Fig. 1). Site locations (and abbreviations) were: San Felasco Hammock (SF), Alachua Co.; Morningside Nature Center (MS), Alachua Co.; Spruce Creek Preserve (SC), Volusia Co.; Orange City (OC), Volusia Co.; Bok Tower Gardens (BT), Polk Co.; O'leno State Park (OL), Columbia Co.; Suwannee River State Park (SR), Suwannee Co.; Wekiwa Springs State Park (WS), Orange Co.; Sandhill Boy Scout Reservation (BS), Hernando Co.; Janet Butterfield Brooks Preserve (JB),

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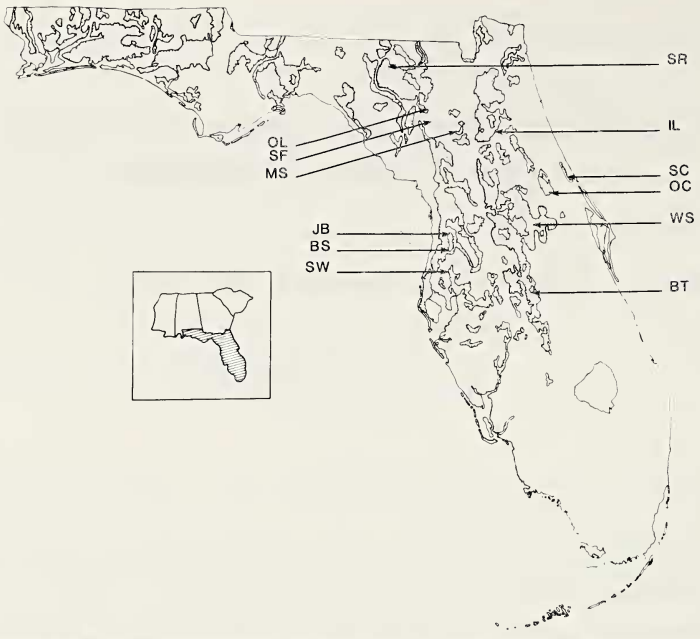

Figure 1.—Sandhill study site locations in Florida. See text for abbreviations. Sandhill distributions (stippled) are based on Davis (1980) and do not reflect minor sites of this community due to the scale of the illustration.

Hernando Co.; Interlachen (IL), Putnam Co.; Starkey Well Field Area (SW), Pasco Co.

Sandhills are xeric upland communities. Laessle (1958) and Myers (1985) provide a general summary of this community type. The tree layer is dominated by longleaf pine, *Pinus palustris*, and turkey oak, *Quercus laevis*. The understory consists chiefly of wiregrass, *Aristida stricta*, wild buckwheat, *Eriogonum tomentosum*, and saw palmetto, *Serenoa repens*.

METHODS

Arachnids were collected using 5 pitfall traps and 2 herp arrays. Pitfall traps were patterned after Muma (1973) and contained a 0.47 l mixture of ethylene glycol, water, and 95% ethanol in a ratio 2:1:1. The traps were randomly placed in each study site during the first collection period. During subsequent collections the traps were placed in the same location as in the first collecting period.

Two standard herp arrays of drift fences were also used to collect arachnids (Campbell and Christman 1982). Each array consisted of four sheet metal arms (7.6 m long) arranged to correspond to the cardinal directions. Two pitfall traps (21.14 l plastic buckets) were placed at the ends of each arm, and did not contain a preservative. Arachnids were removed from pitfalls daily. Two funnel traps made of fine-mesh wire screen were placed on each side of the sheet metal. The funnels were located at the midpoint of each arm.

Identification.—All specimens were identified to lowest possible taxon. James C. Cokendolpher, Texas Tech University, identified the opilionids. William B. Muchmore, University of Rochester, identified the pseudoscorpions. All other

Table 1.—Arachnid fauna collected in sandhill communities in Florida. See text for abbreviations.

ORDER	Collection sites												
Species	SF	MS	SC	OC	BT	OL	SR	WS	BS	JB	IL	SW	Totals
SCORPIONIDA													
Centruroides hentzi (Banks)	2	17	20	5	50	3		10	9	15	7	23	161
PSEUDOSCORPIONES													
Planctolpium peninsulae Muchmore			1	4	1	1			4	1	4		16
Novohorus obscurus (Banks)			1					1				1	3
Paratemnus elongatus (Banks)						1			1	1			3
UROPYGI													
Mastigoproctus giganteus (Lucas)			3	8									11
SOLPUGIDA													
Ammotrechella stimpsoni (Putnam)					4					1			5
OPILIONES													
Leiobunum aurugineum Crosby & Bishop		42	1	18		9	1		58	64	12	1	206
L. bimaculatum Banks	2			1		7	4		1				15
Eumesosoma nigrum (Say)	1					1							2
Hadrobunus sp.	7	36	9	13		6	12		25	8	6	2	124
Vonones ornata Say	1	3	1		1	1	2	5	1	8		1	24
ACARINA													
Mites	14	32	166	13	8	89	84	6	33	16	9	4	474
Ticks													
Amblyomma americanum (L.)			4			4							8
Dermacentor variabilis Say											2		2
TOTALS	23	130	206	62	64	122	103	22	132	114	40	32	1054

identifications were made by the senior author. Voucher specimens have been deposited at Florida State Collection of Arthropods, Division of Plant Industries, Gainesville, Florida.

Ground-level vegetation was sampled to determine if these microhabitat features were correlated with the abundance of arachnids. Twenty points were selected at random, and woody plants less than 2.54 cm in diameter at 1.37 m above the ground were counted in plots (3 x 2 m). Plot sides were used as line transects (5 m) to measure the canopy interception of grasses and herbs. Lastly, 10 plots (0.1 m^2 each) were randomly positioned and leaf litter collected, oven-dried, and the mass determined to the nearest gram. All measurements were taken during the second year of study. Pearson correlation coefficient was used to test the relationship between group abundance and ground level habitat features of the sandhill study sites (SAS Institute 1985).

RESULTS AND DISCUSSION

A total of 1054 arachnids belonging to 6 orders were collected. Species composition, total number of individuals trapped, and percentage collected with each method in the twelve study sites are listed in Tables 1 and 2. Comparison of seasonal and yearly abundance are in Table 3.

Table 2.—Percentage of arachnids collected by funnels (F), buckets (B), and pitfall traps (P).

ORDER Species	Methods F	 B	 P
SCORPIONIDA			
Centruroides hentzi (Banks)	5.0	95.0	0.0
PSEUDOSCORPIONES			
Planctolpium peninsulae Muchmore	0.0	31.3	68.7
Novohorus obscurus (Banks)	0.0	100.0	0.0
Paratemnus elongatus (Banks)	0.0	33.3	66.7
UROPYGI			
Mastigoproctus giganteus (Lucas)	0.0	100.0	0.0
SOLPUGIDA			
Ammotrechella stimpsoni (Putnam)	0.0	75.0	25.0
OPILIONES			
Leiobunum aurugineum Crosby & Bishop	55.0	39.3	5.7
L. bimaculatum Banks	53.3	46.7	0.0
Eumesosoma nigrum (Say)	0.0	50.0	50.0
Hadrobunus sp.	19.4	39.3	5.7
Vonones ornata Say	8.3	25.0	66.7
ACARI			
Mites	0.4	12.0	87.6
Ticks			
Amblyomma americanum (L.)	0.0	0.0	100.0
Dermacentor variabilis Say	0.0	0.0	100.0
TOTALS			

One-hundred and sixty-one scorpions of a single species, *Centruroides hentzi* (Banks), were collected. Correlation (*r*) of scorpion abundance with ground-level habitat features is given in Table 4. No significant correlations were found, but scorpions were less abundant where shrubs were more common and plant litter accumulation was greater. *Centruroides hentzi* is commonly found under stones, logs, litter, and also under bark of dead standing trees (Muma 1967).

Males represented 67.7% of the total number of scorpions collected, while females represented 19.3% of the total population. Twenty-one juveniles were collected. All juveniles were collected in March, May, November, and February. Corey and Taylor (1987) collected 86% of their *C. hentzi* population from July through September, with all juveniles being collected in September. They found the greatest number of individuals in sand pine scrub, an upland xeric community with a well-developed shrub layer (Laessle 1958; Myers 1985).

Table 3.—Percentage of arachnids collected by season and year in the twelve sandhill study sites.

	1st Year					2nd Year				
Order	Fall	Winter	Spring	Summer	Total	Fall	Winter	Spring	Summer	Total
Scorpionida	9.9	3.7	13.7	7.5	34.8	19.3	5.6	24.2	16.1	65.2
Pseudoscorpiones	0.0	13.6	9.1	4.6	27.3	0.0	0.0	50.0	22.7	72.7
Uropygi	18.2	0.0	0.0	0.0	18.2	54.5	0.0	0.0	27.3	81.8
Solpugida	20.0	0.0	0.0	0.0	20.0	20.0	0.0	60.0	0.0	80.0
Opiliones	13.9	20.1	15.5	12.3	61.8	10.2	15.0	3.2	9.8	38.2
Acari										
mites	36.2	5.1	23.0	4.2	68.5	1.3	5.9	12.9	11.4	31.5
ticks	10.0	10.0	60.0	0.0	80.0	0.0	0.0	20.0	0.0	20.0

Table 4.—Correlation (r) of arachnid abundance with ground-level habitat features of sandhill study sites in Florida. *= r value significant at $P < 0.05$.

	Correlation of arachnid abundance with habitat features		
Order	Shrub density (no./m^2)	Grass-herb ground cover (cm)	Mass of plant litter (g)
Scorpionida	−0.516	0.237	−0.349
Pseudoscorpiones	−0.158	−0.216	0.601*
Uropygi	−0.056	−0.022	0.590*
Solpugida	−0.508	0.510	−0.330
Opiliones	−0.364	−0.209	0.094
Acari	−0.076	−0.354	0.620*

Two of the three species of pseudoscorpions found in sandhills, *Planctolpium peninsulae* Muchmore and *Novohorus obscurus* (Banks), were collected by Corey and Taylor (1987). They collected *P. peninsulae* from a sand pine scrub community and *N. obscurus* from pond pine, sand pine scrub, and pine flatwoods communities.

Pseudoscorpions spend most of their time in small crevices (Weygoldt 1969). Such microhabitat features on our study sites were associated with the bark of standing or fallen tree trunks and litter. Our sampling devices captured occasional individuals moving on the ground surface and probably underestimated the abundance of pseudoscorpions. A significant correlation ($r = 0.601$, $P < 0.05$) was found between pseudoscorpion abundance and mass of plant litter (Table 4).

Eleven Uropygi from a single species, *Mastigoproctus giganteus* (Lucas), were collected. These animals are often found under rotten logs and other debris on the surface of the ground (Muma 1967).

Five individuals of the solpugid *Ammotrechella stimpsoni* (Putnam) were collected. This is the only solpugid that occurs in peninsular Florida (Muma 1967).

A total of 371 opilionids representing 5 species and 2 families were collected. *Vonones ornata* Say was the most common opilionid collected by Corey and Taylor (1987), and was found in sand pine scrub, pond pine, and pine flatwoods communities.

Opilionids were not found to be correlated with ($P > 0.05$) shrub density, ground cover, or plant litter (Table 4).

Two individuals of *Eumesosoma nigrum* (Say) were collected. This species is found throughout the year in moist places under debris (Cokendolpher 1980).

Jennings, Houseweart, and Cokendolpher (1984) used pitfall traps to sample the epigeal phalangid fauna in strip clearcut and dense spruce-fir forest of Maine. They collected a total of 8 species, with 1 or 2 species being more abundant than the others in each habitat. Carter and Brown (1973) reported six species from pitfall traps in New Brunswick.

Tick and mites (Acari) represented 45.9% of the total arachnid population and were significantly correlated ($P < 0.05$) with the mass of plant litter (Table 4). Mites comprised 97.9% of the Acari. Two species of ticks were collected: *Amblyomma americanum* (Linnaeus) and *Dermacentor variabilis* Say.

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